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(71) Applicant (for all designated States except US): **VICTREX MANUFACTURING LIMITED** [GB/GB]; Victrex Technology Centre, Hillhouse International, Thornton Cleveleys, Lancashire FY5 4QD (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **CHARNOCK**, Peter [GB/GB]; 7 Elvaston Road, Carleton, Poulton-Le-Fylde, Lancashire FY6 7TH (GB). **DEVINE**, John, Neil [GB/GB]; 32 Sheringham Way, Poulton Le Fylde, Lancashire FY6 7EE (GB). **WILSON**, Brian [GB/GB]; 1 White Lea, Cabus, Garstang, Lancashire PR3 1JG (GB).

(74) Agents: **NEILL**, Alastair, William et al.; Appleyard Lees, 15 Clare Road, Halifax HX1 2HY (GB).

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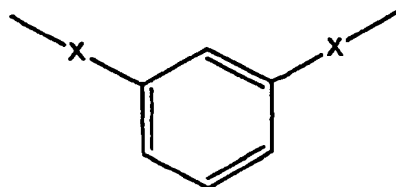
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(54) Title: POLYMERIC MATERIALS



(A)

(57) Abstract: A polymer electrolyte membrane or gas diffusion electrode includes an ion-conducting polymeric material which includes moieties of formula (A) which are substituted on average with more than 1 and 3 or fewer groups (e.g. sulphonate groups) which provide ion-exchange sites and hydrogen atoms of said moieties are optionally substituted, wherein each X in said moieties of formula A independently represent an oxygen or sulphur atom. The ion conducting polymeric material is suitably prepared by controllably sulphonating a polymeric material using about 100% sulphuric acid at 34°C to 36°C.

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# INTERNATIONAL SEARCH REPORT

Intern Application No  
PCT/GB2004/001401

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H01M8/10 H01M4/86

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01M C08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, COMPENDEX, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 362 836 A (HELMER-METZMANN ET AL) 8 November 1994 (1994-11-08) column 2, lines 13-35	1-26
X	WO 01/19896 A (VICTREX MANUFACTURING LIMITED; WILSON, BRIAN; KEMMISH, DAVID, JOHN; CH) 22 March 2001 (2001-03-22) page 5, line 27	1-23
X	US 4 273 903 A (ROSE ET AL) 16 June 1981 (1981-06-16) claims 1-6; example 12	1-13, 19-26
X	EP 0 382 440 A (IMPERIAL CHEMICAL INDUSTRIES PLC) 16 August 1990 (1990-08-16) page 2, line 46 - page 3, line 51	1-13, 18-20
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

14 March 2005

Date of mailing of the international search report

24/03/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Reich, C

# INTERNATIONAL SEARCH REPORT

Inten      al Application No  
PCT/GB2004/001401

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>KIM Y S ET AL: "Fabrication and characterization of heteropolyacid (H3PW12O40)/directly polymerized sulfonated poly(arylene ether sulfone) copolymer composite membranes for higher temperature fuel cell applications" JOURNAL OF MEMBRANE SCIENCE, ELSEVIER SCIENTIFIC PUBL.COMPANY. AMSTERDAM, NL, vol. 212, no. 1-2, 15 February 2003 (2003-02-15), pages 263-282, XP004402835 ISSN: 0376-7388 page 265, column 1, paragraph 2</p>	1-26

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB2004/001401

## Box II Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 1-26 (all in part)  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB2004 /001401

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 1-26 (all in part)

Present claims 1-26 relate to an extremely large number of possible polymers and products derived therefrom. Support within the meaning of Article 6 PCT and/or disclosure within the meaning of Article 5 PCT is to be found, however, for only a very small proportion of the products claimed. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible. Consequently, the search has been carried out for those parts of the claims which appear to be supported and disclosed, namely those parts relating to the sulphonated polyarylether ketones described in the examples and closely related compounds in polymer electrolyte membrane or gas diffusion electrode materials and methods of their production.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB2004/001401

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